

**UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
RENTON, WASHINGTON 98055-4056**

In the matter of the petition of

**EMPRESSA BRASILEIRA DA
AERONÁUTICA S.A. (EMBRAER)**

for an exemption from § 25.783(f) of the
Federal Aviation Regulations for the Rear
Electronic Compartment Access Hatch.

Regulatory Docket No. 29593

PARTIAL GRANT OF EXEMPTION

By letter PCE-0816/99, dated May 21, 1999, Mr. Luiz Alberto Gomes de Figueiredo, Certification Assistant, Empresa Brasileira da Aeronáutica (Embraer), Av. Brig. Faria Lima 2170, São José dos Campos, SP, Brazil, petitioned for an exemption from the requirement for a pressurization prevention means of § 25.783(f) for the rear electronic compartment access hatch on the Embraer Model 135 airplane.

Sections of the FAR affected:

Section 25.783(f) (“Doors”), as amended by Amendment 25-88, requires, in pertinent part, that doors have a means to prevent pressurization of the airplane to an unsafe level if the door is not fully closed and locked. This requirement applies to all doors (which include hatches), irrespective of the type or direction of initial opening movement of the door.

Petitioner's Supportive Information:

Embraer understands that the intent of the requirement is to prevent the aircraft pressurization to unsafe levels if an external door is not fully closed and locked. The door design solution (structure and locking mechanism) should be such that an inadvertent opening in a pressurized or unpressurized flight, which could jeopardize the

passengers or aircraft safety, must be extremely improbable. Embraer believes that the design solution adopted for the access hatch provides a level of safety equivalent to that provided by the rule, and that granting this request for exemption will not adversely affect the safety of the EMB-135 airplane.

To substantiate its request, Embraer offers the following arguments and explanations:

Hatch design:

“The hatch on the Embraer Model EMB-135 airplane is a removable plug-in type door with continuous stops to support the pressurization loads. It is latched by four latching pins, actuated and locked by an external actuating handle. When the hatch is locked, this actuating handle is stowed in a recess in the outer skin.

When the aircraft is pressurized, the hatch is pushed against the continuous stop on the fuselage frame. The four latching pins hold the hatch closed for the case of an unpressurized flight against any inertia force or external aerodynamic load.

To open the hatch, the actuating handle is pulled out from the stowed position and then rotated 90 degrees. To remove the hatch, it must be first be pushed inside the fuselage and rotated over a hinge pin. Then, this hinge pin must be removed to allow farther rotation to make it possible for its passage through the fuselage opening. To close the hatch, the reverse procedure must be executed.”

Design Features Analysis:

“Due to the design features of the hatch, the hatch itself constitutes a vent panel to prevent pressurization if it is not fully closed and locked. In this respect, the following conditions can occur:

- a. The hatch is closed and locked.
 - With the hatch installed, closed, and locked, the actuating handle is in the stowed position, the warning system is deactivated and the airplane can be pressurized with no unsafe condition.
- b. The hatch is closed (in position) but not latched and locked.
 - To be able to install the hatch in the access opening, the hatch hinge must be engaged and the locking pins retracted by positioning the actuating handle outside its stowing recess and rotating it 90 degrees.

- With the door mechanism positioned as described above, the aircraft will be safely pressurized with no unsafe condition. The fuselage recess and the hatch hinge will guide the hatch to its final position against the fuselage continuous stop (no misalignment will be possible).
- In case some debris or tool is positioned between the door and fuselage stop, the residual strength of the fuselage stop or doorframe has been proven to be enough to preserve the structural integrity under the most conservative failure assumption.
- In case of an unpressurized flight, the hatch could swing open on its hinge in a controlled movement with no unsafe consequences to the aircraft. Since this door is outside the main cabin, this event will not present any risk to the passengers.
- It is important to note that under the above assumption, the warning system (Access Door Opt) in the Engine Indicating and Crew Alerting System (EICAS) will be activated; furthermore, the actuating handle (red in color) will be outside its recess, giving a clear indication of the open door in a walk-around inspection.

c. The hatch remains open:

- If, in the attempt to install (close) the door, the hatch hinge is not engaged or the actuating handle is inside its recess, it will be impossible to force the hatch inside the access fuselage recess. In this case the door will remain open and the opening between the fuselage and the door will not allow the cabin to be pressurized.
- It is important to note that, in this case, the caution message ‘Access Door Opt’ will be activated in the EICAS display and the warning indication ‘Door Open’ with the respective red frame will be shown on the MDC pictorial.

All of the possibilities described above that can occur during the hatch closure operation and its consequences can be better verified and understood by inspection and actual simulation in the airplane.”

Additional Safety Considerations:

“It is very important to stress that this hatch, being an inspection access, will only be operated (opened and closed) by authorized and trained personnel. The components inside the rear electronic compartment have a planned maintenance frequency of 2,000 flight hours (5 A inspection periods), so the opening of the door is not very frequent. It is also important to note that the door is positioned in a position (high above the ground) which is not possible to be reached without special equipment (maintenance stair or platform).”

Further arguments:

“Embraer adopted this type of hatch design solution in a previous airplane model (EMB-120). The service experience of this aircraft, plus the experience already accumulated with the EMB-145 model (with two inspection hatches with the same design solution) indicates that this hatch design approach complies with the intent of the requirement. Embraer also understands that other competitors’ airplanes are using the same type of design solution with the same degree of success.

As the EMB-135 airplane is a derivative of the EMB-145 model, great care has been taken to minimize the design changes to take advantage of the parts commonality of both models. In case of changes in the hatch design for the EMB-135, the following undesired consequences would be felt:

- It will be a burden to the operators of both models since the interchangeability of parts will be affected.
- It will be a burden to Embraer since a new door will have to be designed (in a very short period) and would require two different part numbers manufactured in otherwise similar doors.
- New derivative aircraft of competitor manufacturers are being certified with the same hatch design philosophy used in the EMB-145 model. Embraer understands that this is possible since the older models were certified using a previous certification basis. Nevertheless, although having the same level of safety, maintaining hatch commonality will make these airplanes more competitive than Embraer.”

Public Interest:

Embraer states that, if the EMB-135 model is to have a door design different from the EMB-145, then it will pose a burden to the operators of both models, since the interchangeability of parts will be affected.

Additionally, Embraer states that a delay in delivery of the airplane will create a significant economic burden to the operators and will be detrimental to the traveling public.

Publication and Comment:

A summary of the petitioner's May 21, 1999, petition was published in the Federal Register on June 21, 1999 (64 FR 33131). No comments were received.

FAA's Analysis/Summary

Amendment 25-54 of 14 CFR part 25 [Federal Aviation Regulations (FAR)] revised the design requirements of § 25.783 to prescribe additional safety features that must be incorporated in all fuselage external doors. These were separate and independent safety features that were intended to provide multiple layers of protection against mechanical failure and human error. Some of the new features were specifically for doors for which the initial opening is not inward. However, the requirement for a means to prevent the “initiation” of pressurization to a unsafe level if the door was not fully closed and locked was prescribed for all doors, irrespective of their initial movement. That rulemaking action was promulgated with due regard to several commenters who suggested that this requirement should not be applied to plug type inward-opening doors.

The intent of the rule, as proposed, was to prevent the initiation of pressurization when the door is not fully closed and locked. The words “. . . to an unsafe level . . .” were added in view of public comments in the rulemaking process and are intended to provide for the small amount of pressure that may develop when air flows through the pressure vent panels or outflow valves as pressurization of the fuselage is attempted, but prevented, by these devices. Any level of pressure applied to an improperly locked door is considered unsafe if the failure of the door under that level of pressure would be a hazard to the airplane.

Embraer confirms that the inadvertent opening of the door under pressure would be hazardous at some level and so a means is required to prevent “the initiation” of pressurization to those levels. The FAA understands that the additional safety increment provided by this requirement is considerably less for an inward-opening plug type door than for an outward-opening door. Nevertheless, there is some safety increment even for plug type doors, when all the possible failures, human errors, and abuses that could occur to doors is considered.

The FAA considers that certain doors, such as maintenance hatches, are normally closed by trained personnel and used very infrequently. This further reduces the safety increment that would be provided by a pressurization prevention means, since one of the main purposes of this safety feature is to guard against human error. In fact, the FAA Advisory Circular 25.783-1, “Fuselage Doors, Hatches, and Exits,” accepts that maintenance access hatches need not have the means to prevent pressurization if they are

- considerably less than the size of the opening prescribed by § 25.365(e)(2) (“Pressurized compartment loads”) for rapid decompression, and
- less than the openings used in establishing the oxygen requirements for the airplane.

The Embraer rear electronic bay hatch is larger than this maximum allowed size.

Nevertheless, there are many such doors in the existing transport fleet that do not have the pressure prevention feature, and for which there is a good service experience. Derivatives

of these airplanes (including those in direct competition with Embraer) have been recently approved by FAA and are allowed under the certification process to use their original models' older certification bases, which did not require this additional safety feature. Although they may not quite achieve the level of safety intended by the Amendment 25-54 revisions, the FAA considers that they are providing an adequate level of safety.

However, new door designs are expected to achieve the full level of safety prescribed by the rules in their certification basis and the EMB-135 certification basis includes the provisions that were incorporated in Amendment 25-54. Therefore, the FAA concludes that the Embraer rear electronic bay door must be brought into compliance with the certification basis.

The petitioner has requested a permanent exemption from § 25.783 for the electronic bay door based on the position that it provides an equivalent level of safety to the transport fleet, and also on the manufacturer's need for this door to have parts commonality with the prior EMB-145 airplane. In addition, this would put the EMB-135 airplane on an equal footing with its competitors' airplanes.

With regard to the petitioner's comments concerning competition with existing airplanes certificated prior to Amendment 25-54, the FAA observes that the introduction of any new factor, including new safety requirements, into the marketplace can always be expected to be temporarily disturbing to the status quo. It is unacceptable to seriously consider foregoing the introduction of new safety requirements because it may disturb the existing competitive balance.

The FAA can see no justification for a permanent exemption from this provision. However, in consideration of the fact that the electronic bay hatch does achieve a level of safety equivalent to many, if not most, airplanes in the fleet and the fact that it is used infrequently and only by mechanics, the FAA considers it appropriate to provide a temporary exemption to allow the manufacturer time to develop a pressure prevention system for the electronic bay hatch. In order to qualify for this temporary exemption Embraer must install a placard on the EMB-135 electronics bay access hatch indicating that the door is to be used only for maintenance actions.

The conditions associated with the following partial grant reflect the considerations and discussions above, and are established to allow a controlled and time-limited use of a non-compliant access door.

In consideration of the foregoing, I find that a partial grant of exemption is in the public interest and will not significantly affect the level of safety provided by the regulations. Therefore, pursuant to the authority contained in 49 USC 40113 and 44701, delegated to me by the Administrator (14 CFR 11.53), Empress Brasileira da Aeronáutica S. A. (Embraer) is hereby granted the following to the extent necessary to permit type certification of the EMB-135 airplane:

1. Before type certification of the EMB-135 airplane, submit through the Centro Técnico Aeroespacial (CTA) to the Atlanta Certification Office for approval, the design for a placard on the rear electronic bay door with words to the effect that the door is to be used strictly for maintenance access and that such access is considered a maintenance action.
2. Within eighteen months from the issue date of this partial grant, the petitioner shall submit to the CTA and the Atlanta Aircraft Certification Office, for FAA approval, a rear electronic bay door design meeting the full intent of section 25.783(f).
3. Upon successful completion of certification evaluation, the petitioner shall provide these offices with a schedule for assuring that the affected Embraer EMB-135 fleet will be retrofitted by December 31, 2001.

This partial grant of exemption expires December 31, 2001. Accordingly, the airworthiness certificates issued for any U.S.-registered airplanes equipped with the rear electronic bay access hatch that have not been shown to comply with the conditions of this grant by that date will also expire on that date.

Issued in Renton, Washington, on July 13, 1999.

Original signed by:

Donald L. Riggin
Acting Manager, Transport Airplane Directorate
Aircraft Certification Service